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BUBONIC PLAGUE.

A MENACE TO AMERICAN SEAPORTS.¹

By W. C. RUCKER, Assistant Surgeon General, United States Public Health Service.

At the present time bubonic plague is widely spread over the face of the globe. In the North American continent it exists in California, Seattle, and New Orleans. It has just broken out afresh in Cuba, and in South America the disease was reported only a short time since in Brazil, Ecuador, and Peru. In September last plague appeared in Italy and Greece, and only last August there occurred nine cases with three deaths in Liverpool, while in October plague broke out in pneumonic form in Portugal. Plague is present in Russia, cases having been reported in Astrakhan less than a year ago.

Egypt has plague, and within the past six months the disease has also appeared in British East Africa, German East Africa, Senegal, and the island of Mauritius. In India and Indo-China plague is endemic. Ceylon, Siam, and the Straits Settlements must be considered as infected. The Caspian coast of Persia reported cases as recently as last December, as did also Turkey in Asia. From April 1 to September 30, 1914, there were 8,794 cases with 7,728 deaths in the Dutch East Indies, and a report of October 31 last shows that the disease was still spreading there with unabated violence. Japan is infected. Plague exists in practically all of the large ports of China, and cases were reported less than a year ago in the Philippine Islands and Hawaii.

Plague is essentially a ship-borne disease, and therefore those ports which have free commercial communication with the rest of the world are liable to its incursions unless they erect those barriers which will prevent the introduction of rats. Plague is a rodent disease, transmitted usually from rat to rat and from rat to man through the intermediation of the flea. No one species of rat and no single species of flea is necessary for the transference of the bacillus of plague from the sick rat to the well rat or from the sick rat to the well man. Therefore, when it is desired to exclude plague, the operations to be put in force have for their object the exclusion of rats. It is not necessary that this exclusion shall be such as to interfere to any very great extent with the movement of commerce, but in order to be effective it must definitely remove rats from intimate contact with man.

The introduction of rats into a community may be prevented by the thorough fumigation of all ships entering the port, such fumigation to include the cargo as well. Unfortunately, the reliability of this method is somewhat lessened by the fact that it is exceedingly

¹ Read before the Fifth Annual Health Conference of the Medical and Chirurgical Faculty of Maryland, Baltimore, Md., Feb. 12, 1915.

difficult successfully to fumigate vessels for the extermination of rats, and while it is desirable for economic reasons that no more rats be introduced into the community, it should be borne in mind that this method is expensive and should it be omitted a single time the introduction of infected rodents might result. In order to be absolutely successful it should be applied to all vessels regardless of their port of departure. Plague in all probability exists among rodents in many ports of the world without the knowledge of the sanitary authorities of those ports, and there may be places in which the disease is known to exist, but we have no knowledge of it because for commercial reasons the existence of the disease is concealed. Furthermore, it is a well-known fact that in those ports which have a well rat-proofed water front, rats from infected countries leave one ship and, finding no asylum ashore, take passage on an outbound vessel. It is thus seen that the attempt to protect a city or a country against plague by the single measure of fumigation is at best an expensive makeshift.

The truth is that the only sure protection lies in adequate rat proofing. This, in order to be effective, should begin with the water front. No port which does not have rat-proof docks is safe from an incursion of plague, and the menace of this disease is such that it behooves the municipalities of the United States to take immediate steps looking to the accomplishment of this end. This is an economic as well as a public health measure. Every case of human plague in a community costs at least \$7,500. Every case of rodent plague in a community costs at least \$5,000. The enormous losses by reason of quarantine and the diversion of commerce are so great and vary so much as to be almost beyond even approximate estimation.

It is not sufficient that the water front alone be rat proofed. This work should be carried to a point where every premises occupied by man for domiciliary, mercantile, or manufacturing purposes, has been rendered proof against the entry of rodents, and once this has been accomplished the presence of rats in a community, or of disease among them, may be practically disregarded, since if rats have been thrown out of contact with man he need have no fear of the diseases which they carry. More than this, a city which is rat proof has a lower morbidity and mortality rate from the other communicable diseases than those cities which are not rat proof. This applies particularly to the environmental diseases which are so markedly affected by the improvement in the conditions under which man lives and works.

Rat proofing, then, is a prerequisite. There are several methods of making buildings rat proof, but the ideal is by the use of concrete on the ground areas, the stoppage of accidental openings around plumbing and electric wires, the abolition of harborages in double

ceilings, and the closure of roof openings by wire gratings. It should be borne in mind that no rat proofing is absolute against the entry of rats, but it can be made so effective that even should a rat gain entrance it would not find harborage and therefore would be forced to vacate the premises. To a certain extent the manner in which rat proofing is to be applied will depend upon the species of rats present in a given community. In those places in which the Norway rat, which is a ground dweller, is the only variety, particular attention should be directed to the ground areas. In those localities in which black rats and Alexandrine rats also occur, means must be taken to prevent their entry through roof openings because these species are climbing rats. In plague-prevention work, mice may be left out of consideration as they are practically a negligible factor in the perpetuation of plague. For example, out of some 255,000 rats examined in the city of New Orleans, only one infected mouse was found, and this under extraordinary conditions not liable to repetition.

Concrete is the ideal rat-proofing material. It is applied in the form of a side wall at least 2 feet below the surface of the ground, and 1 foot above the floor level. The first provision has been found necessary in order to prevent rats from burrowing underneath the concrete floor and there finding an ideal harborage. The rise above the level of the floor is necessary in frame buildings to prevent the rat from gnawing a hole at the junction of the floor with the side wall. This is particularly important because without it the rat will gain entrance to the space between the outer and inner walls and there be safe from molestation.

The area under the ground floor should be carefully filled in if there be no basement. On the filling should be tamped a layer of gravel, cracked rock, or hard cinders, and on this a concrete floor 5 inches in thickness, with an inch of smooth surfacing. This will protect the ground area, provided all accidental openings about plumbing, electric-light wires, and the like are carefully closed. If there is a basement, this should have a concrete floor with brick or concrete side walls, and in such instances it is preferable that the basement be constructed without a double ceiling, because, as was demonstrated by Surg. Gen. Blue as long ago as 1903, double ceilings make ideal harboring places for rats. Ceilings for the second and third stories should be torn out wherever practicable, thus doing away with the bottom of the boxlike structure which forms such an ideal rodent habitation. If this is not practicable, entrance to the box should be prevented by the use of metal flashings extending 6 inches on the floor and 6 inches up the side wall. This type of rat proofing is usually called "Class A" rat proofing, and is to be used in food depots of every sort and in those business houses which are particularly liable to attract rats. Stables form a subdivision of

Class A rat proofing. Their floors should be of concrete, adequately drained. Stalls should have in addition a grating of wood. Mangers should be metal lined. Grain should be kept in metal-lined, rat-proof bins, and manure should be kept in similar containers.

The rat proofing of domiciles is a much more simple matter. Unfortunately there is considerable prejudice against the use of concrete flooring in houses both on account of the expense of its installation and because the general public imagines that it makes cold floors. Houses may be rat proofed by elevation on brick or concrete piers at least 18 inches from the surface of the ground, the space beneath the house to be free to the entrance of cats and dogs, the natural enemies of the rat. In the case of frame dwellings, the space between the studdings should be stopped with concrete or brick to the height of 1 foot above the level of the ground floor to prevent rats from establishing a residence in the hollow wall.

In many situations it is not practicable to practice rat proofing by elevation, and in such instances a solid chain wall may be substituted, provided that the ground flooring is solid and in good repair. Rat proofing by elevation and by chain wall is known as class B rat proofing.

The value of rat proofing may be to a considerable extent vitiated if the out of door premises is in bad sanitary condition. Wood and lumber in the back yard should be rat proofed by being elevated 18 inches above the surface of the ground, and all outbuildings should be protected against the entrance or harborage of rats.

Another factor in diminishing the value of rat proofing is the presence of rat food. Rat proofing has for its purpose the exclusion of rats and the prevention of their nesting and breeding. By separating the rodent from his pabulum, one of the chief factors in attracting him to the premises has been abolished. This means first of all the maintenance of clean premises, and those cities in which the health officer rigorously enforces all ordinances requiring the cleanliness of the human environment have an additional safeguard against bubonic plague. It means the installation of water-tight metal garbage cans having accurately fitting lids. It means the collection and destruction of the waste products from houses, factories, and stores. If this is done not only is the home of man kept free of rats, but also flies and other insects do not breed in such abundance.

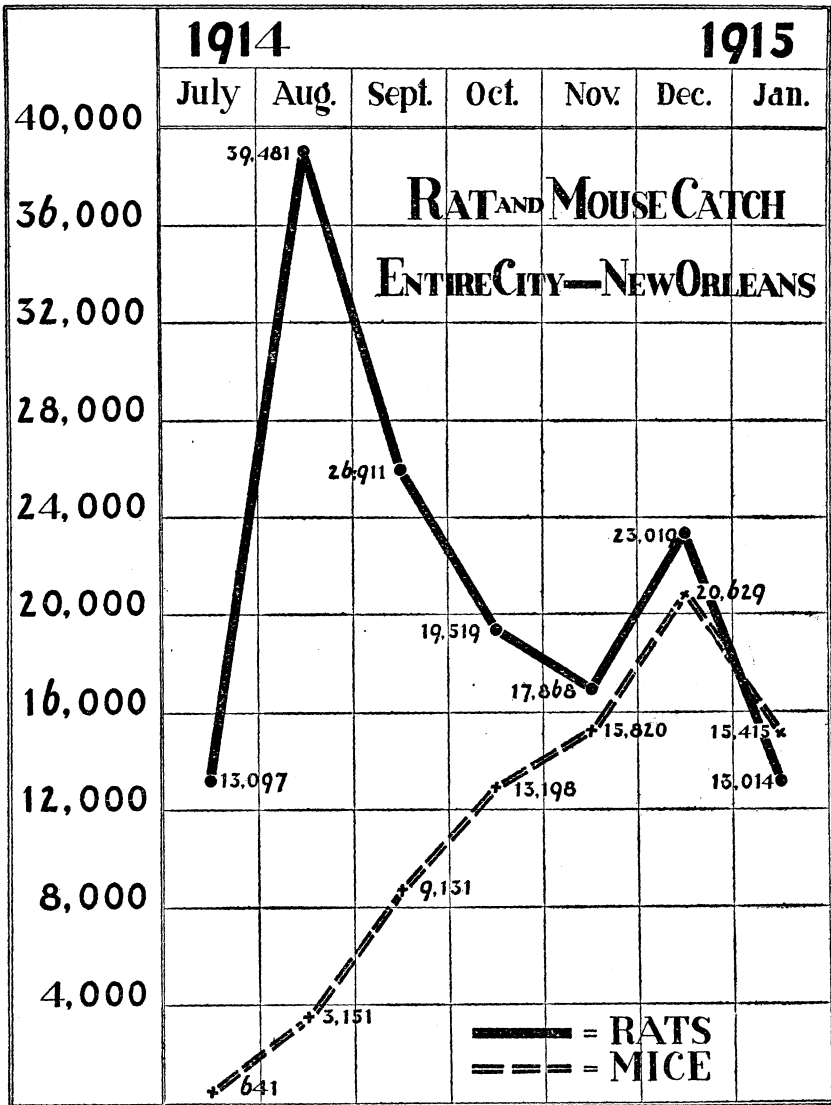
It will be noted that particular emphasis has been laid upon the exclusion and starvation of rats. These are the all-important measures. Poisoning, if carefully done, is of value in reducing the rodent population, but without starvation it is not apt to be particularly effective. Perhaps the best agent for poisoning rats is

phosphorus. It is usually incorporated in a paste of glucose and starch. Glucose reduces to the minimum the liability of the mixture to spontaneous combustion. Arsenic in a menstruum of lard may also be used. Rat poison is usually put out on small pieces of bread, care being taken to cover all the sides of the morsel. Care should also be exercised to see to it that no poison is placed where it may be taken by children or domestic animals.

Another valuable agent in diminishing the number of rats is trapping. This has a twofold purpose. It was found at San Francisco and New Orleans that the number of female rats is generally in excess of the number of male rats and that a certain proportion of the female rats contained unborn rats when captured. This in itself effects a reduction in the number of rodents and it should not be forgotten that even though the female rats may contain no young they are nevertheless the potential mothers of a considerable number of rodents. Intensive trapping reduces the number of rats considerably and one of the best gauges of this reduction is the relation between the number of captured rats and mice. The trapping of mice is accidental and not intentional, the mice taken being a mere by-product of rat catching. The rat is the fiercest enemy of the mouse, and when rats are plentiful mice are very careful not to roam abroad. From this it might be deduced that as the rat population diminished the mice would be able to move about with greater freedom and would therefore be more apt to be taken in traps. Such is actually the case. For example, in July when the anti-plague campaign began in New Orleans, the percentage of mice caught was 4.66; in August it was 7.39; in September, 25.33; in October, 40.34; in November, 46.96; in December, 47.26; while in January it was 54.22. Conversely, the percentage of rats fell from 95.33 per cent in July, to 45.77 per cent in January.

If to trapping is added the laboratory examination of the captured rodents, a second purpose is accomplished. If a considerable number of rats are taken from all portions of a city and subjected to careful laboratory examination it is possible to determine whether or not they are plague infected, and should any prove so, to take those measures which will prevent plague among rats from spreading to human beings. This is most important. No seaport in the United States can truthfully say that it has no plague until it has made a careful survey of its rodent population. It is not enough that a few hundred rats should be sent to the laboratory. It is necessary that thousands be captured and carefully examined by a bacteriologist skilled in the diagnosis of rodent plague. Neither is it sufficient to assume that because rodent plague was not discovered this month, or this year, it may not exist in some future time, and it therefore becomes

the duty of municipalities to appropriate sufficient money to permit their public health departments to continuously trap and examine rats. The rule heretofore has been for municipalities to put this off



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until the presence of human plague makes it absolutely necessary to inquire into the prevalence of rodent plague.

If there is anything at all in the doctrine of preventive medicine, it should be applied to the prevention of disease rather than to its

eradication after the epidemic has gained a serious headway. Plague has already appeared in three cities in the continental United States. It exists in many of the countries with which we have intimate trade relations. It is a disease which disregards climate and geographical location, and merely because its presence has not been discovered in other American seaports is no guarantee whatsoever that it does not exist there among rats at the present time. Plague is a menace to every port on the American seaboard, and with the growth of our foreign commerce this menace is daily increasing. Nothing short of serious interference with commercial relations will prevent its gaining a foothold in American ports unless the municipal authorities of these ports themselves will take cognizance of the danger which confronts them and apply plague-preventive measures before it has become necessary to put plague-eradivative measures into operation. The eradication of plague is both difficult and costly. The prevention of plague is relatively simple and inexpensive. The policy of waiting until human plague has appeared is gambling with human lives and prosperity. The policy of plague protection is health and commercial insurance. Plague has spread around the world. It menaces every port in the United States. This menace will come to naught if we will erect the proper fortifications against plague and take those measures for its prevention while the opportunity lasts.

MORBIDITY REPORTS IN KANSAS.

The following is from a letter sent by the Kansas State Department of Health to all local health officers for the purpose of obtaining their interested cooperation:

STATE OF KANSAS,
STATE BOARD OF HEALTH,
Topeka, April 2, 1915.

To Health Officers:

Morbidity reports are to be mailed each Saturday night. If no reports are received from physicians during week, you are expected to mail us a "No report" card instead. If by the following Wednesday we do not receive either the reports or a "No report" card, you are marked "Delinquent." We are keeping careful check of delinquencies for this year, and we hope to encourage regularity of reports by apprising health officers of their records at the end of each quarter.

For the past quarter—that is, weeks from January 2 to March 27, inclusive—we should have had 12 weekly reports from you. For each week you missed we deducted $8\frac{1}{3}$ per cent from your score. This list will show you where you stand:

COUNTIES.

Bourbon, Brown, Butler, Clark, Clay, Cloud, Graham, Harper, Haskell, Kiowa, Leavenworth, Lincoln, Marion, Miami, Mitchell, Montgomery, Nemaha, Ness, Osage, Ottawa, Riley, Sedgwick, Sherman, Smith, Sumner, Woodson.....	Per cent. 100
Allen, Barton, Chase, Cherokee, Cheyenne, Comanche, Cowley, Doniphan, Douglas, Elk, Ford, Geary, Gove, Hamilton, Jefferson, Kingman, Lane, Lyon, Neosho, Norton, Rawlins, Wallace, Wilson.....	91 $\frac{1}{2}$